DOCUMENT RESUME

ED 103 212 SE 017 354

TITLE	Your World, My World.
INSTITUTION	Environmental Protection Agency, Washington, D. C.
PUB DATE	73
NOTE	51p.
AVAILABLE FROM	Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 (Stock No. 5500-00079, $1.50)
EDRS PRICE	MF-$0.76 HC-$3.32 PLUS POSTAGE
DESCRIPTORS	Air Pollution Control; Conservation Education; Elementary Grades; *Environmental Education; Instructional Materials; Natural Resources; Pesticides; *Pollution; Radiation; *Resource Materials; Science Education; Secondary Grades; Wastes; Water Pollution Control
IDENTIFIERS	Noise

ABSTRACT

Americans of all ages are concerned with the effects of pollution on the environment. This booklet is designed to explain to students the environmental problems related with pollution and its control. The role of the Environmental Protection Agency (EPA) in pollution control is defined and its goals explained. Topics of discussion include clean air and water, solid wastes, pesticides, man-made radiation, and noise pollution. In each case, the topic is defined, examples are given, and work done by the EPA is included. (MA)

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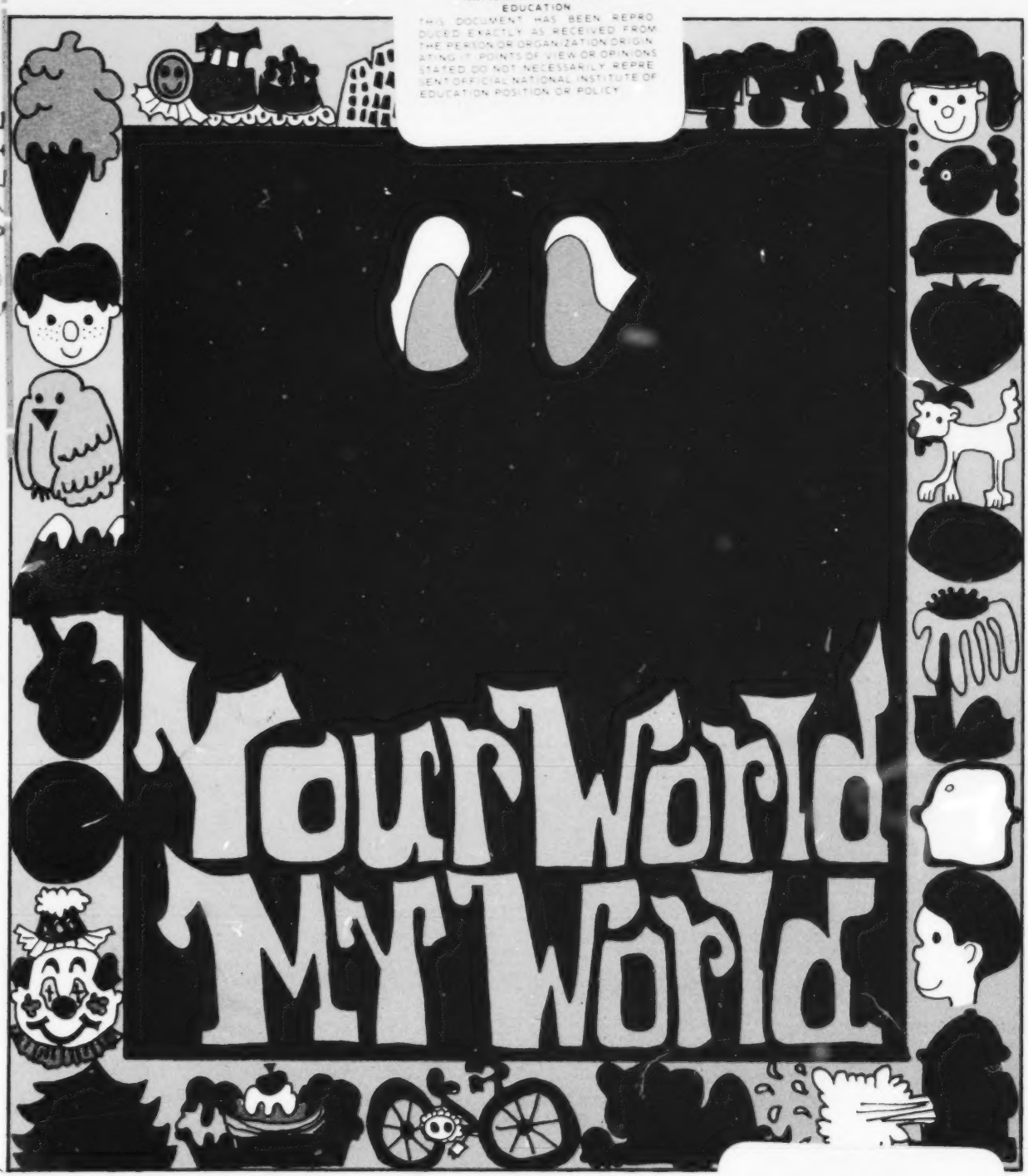

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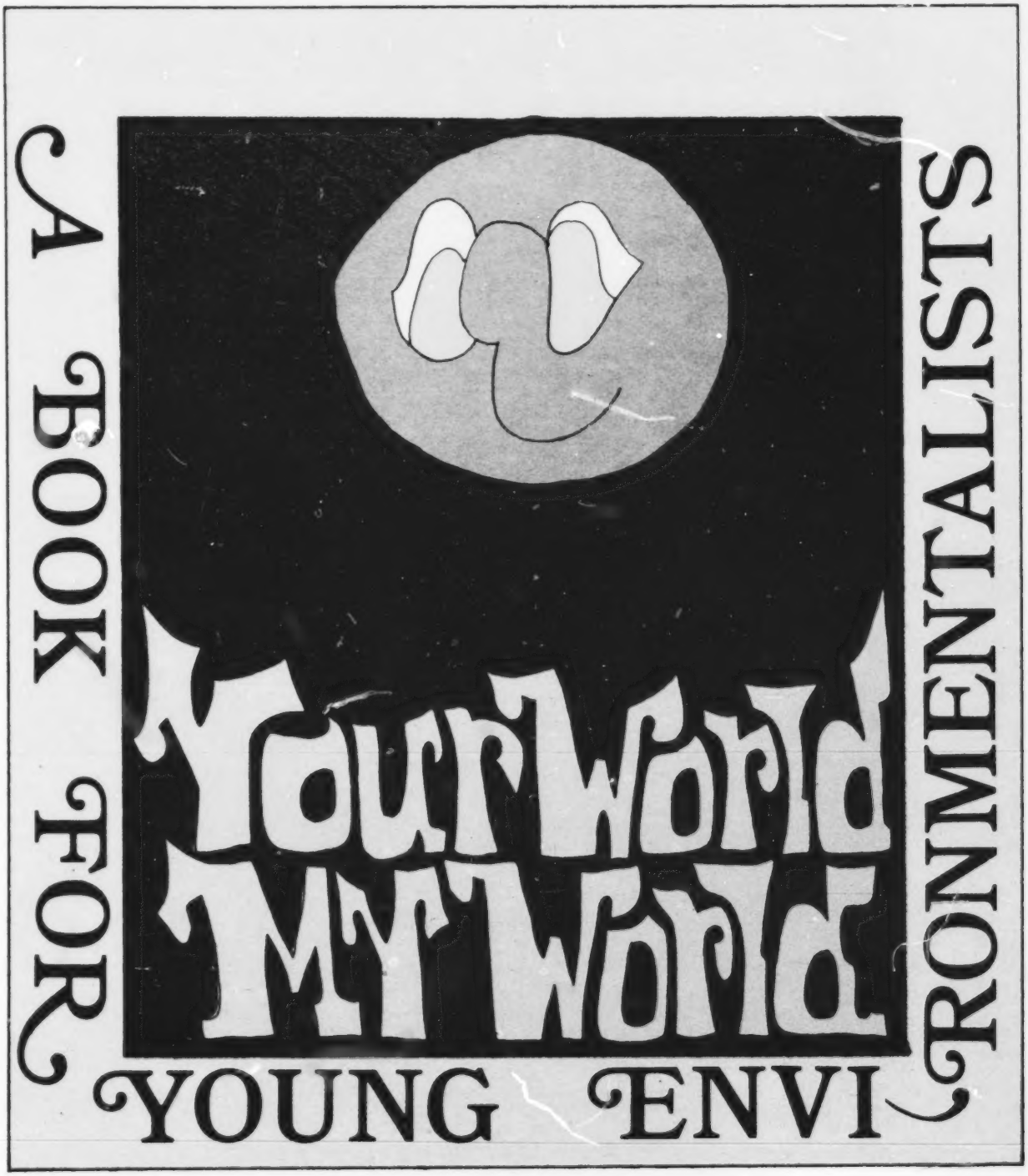

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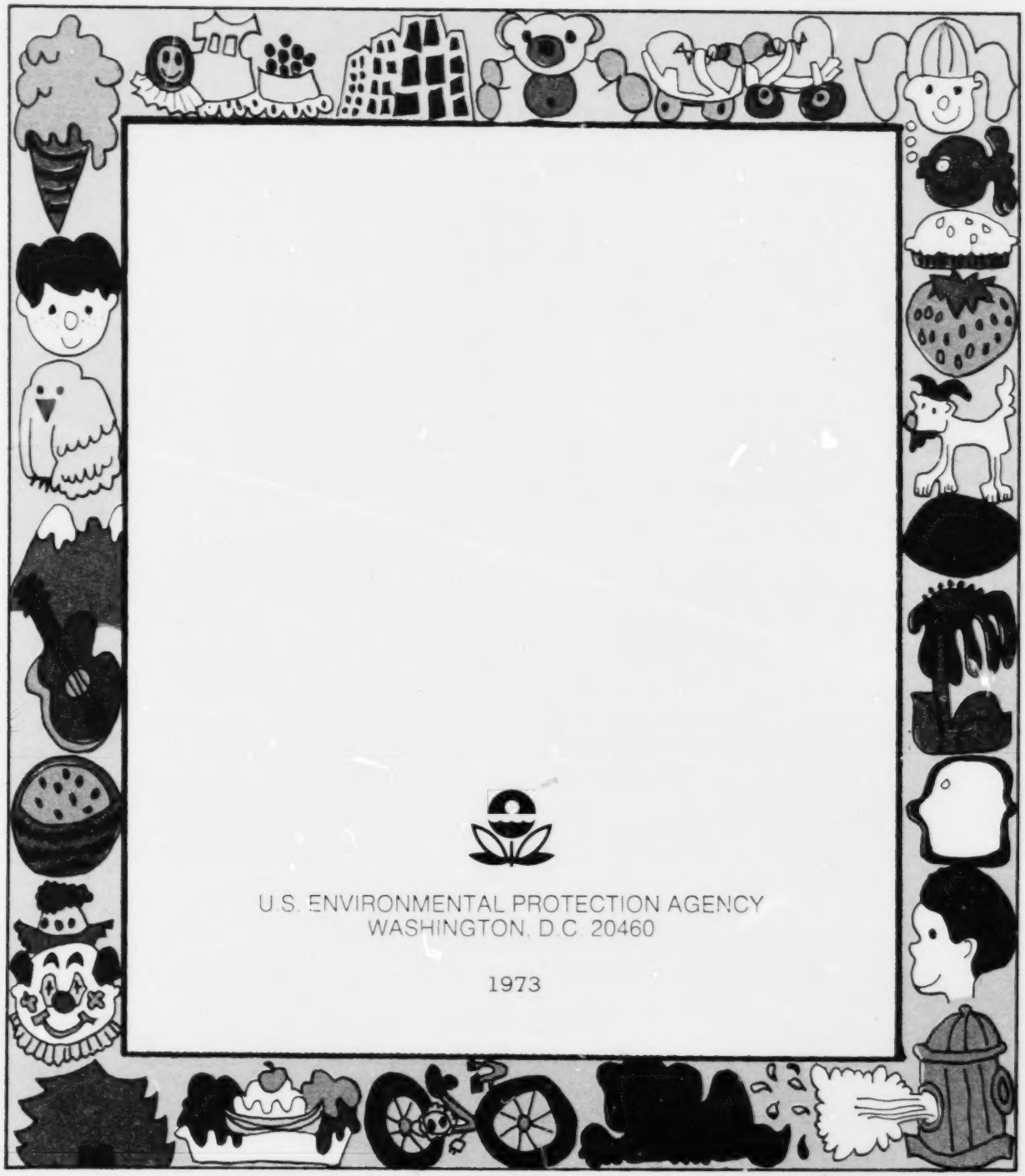

U.S. ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

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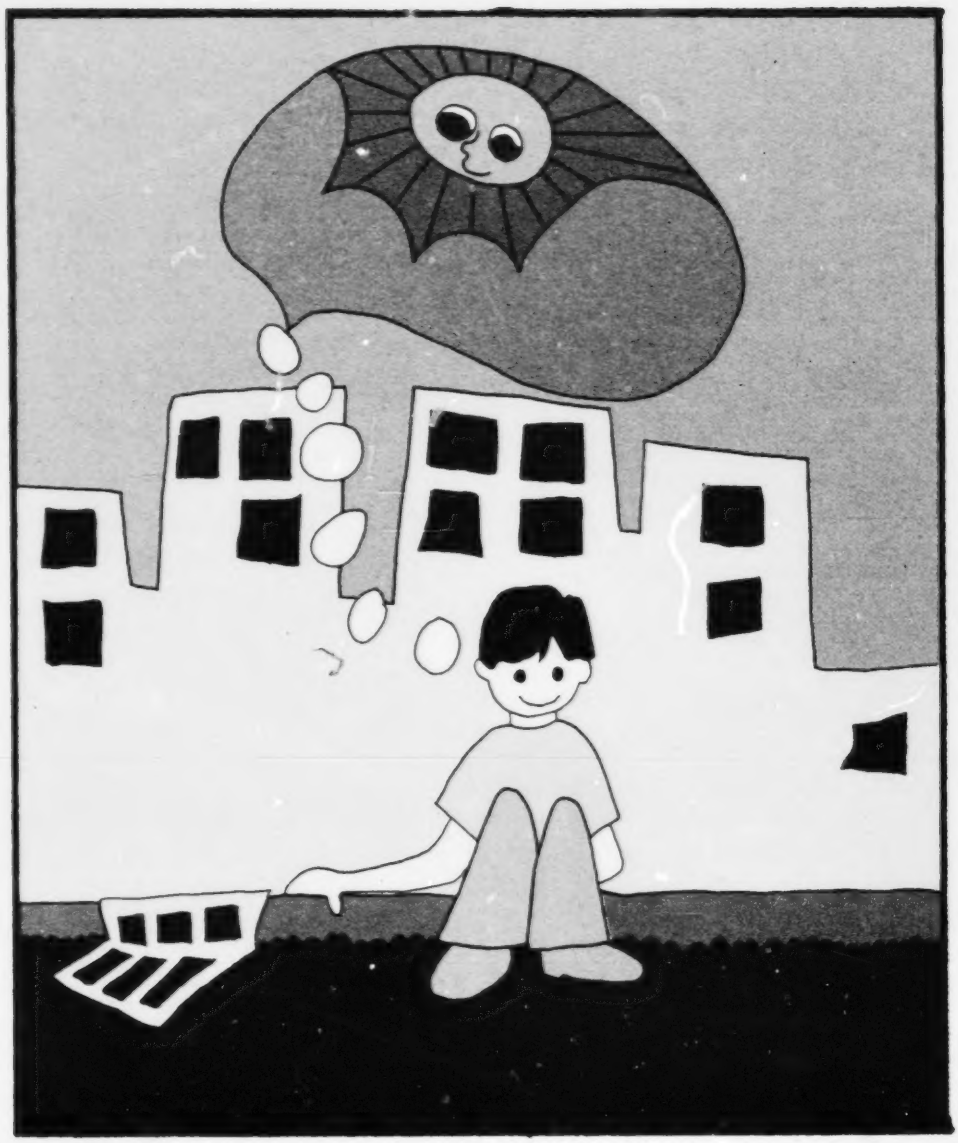

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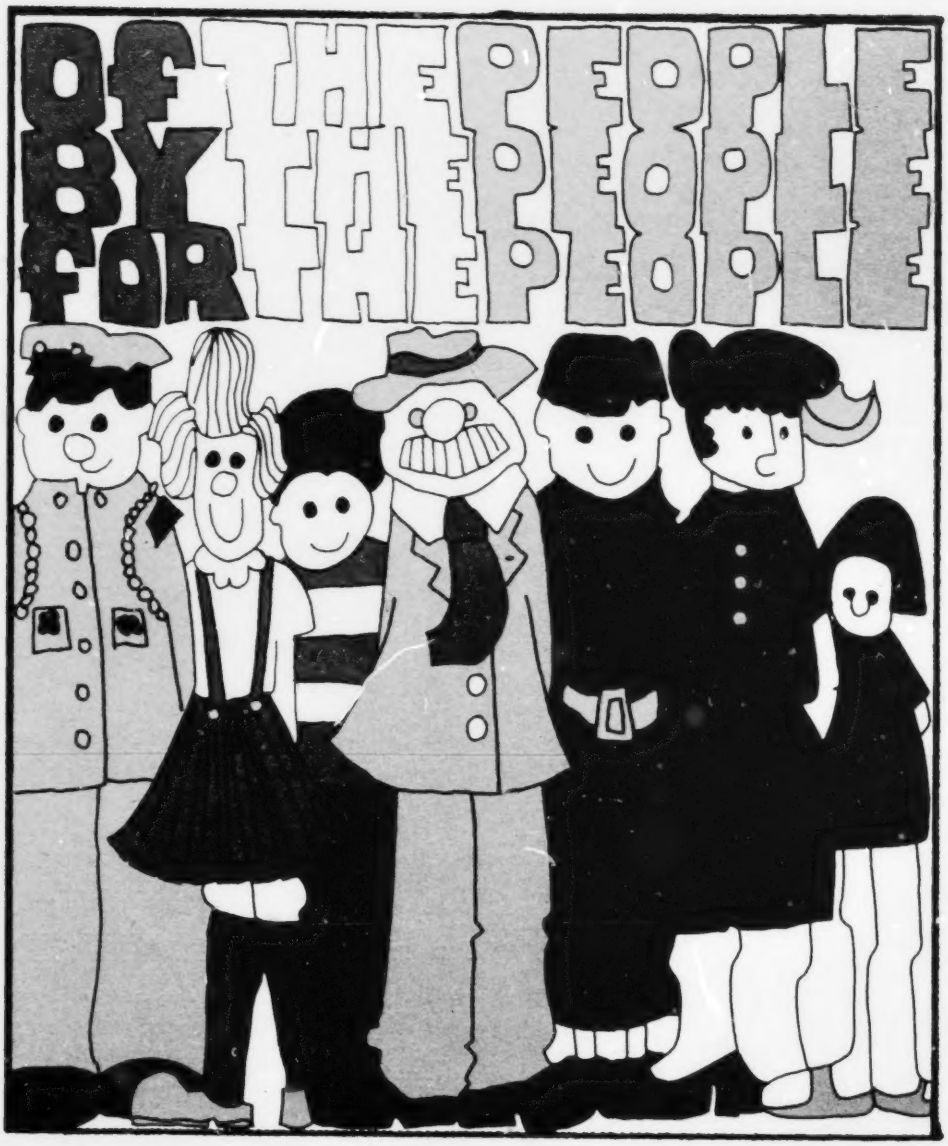

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Foreword

Americans today are very concerned about pollution and the damage it is causing to our environment. This is understandable. Each of us, old and young alike, wants this to be a good world in which to live. We recognize that the world belongs to all of us and all of us, therefore, have a responsibility for making the world today and, more importantly, the world tomorrow, an even better place to live.

What we do, now and in the next few years, will largely determine the kind of place in which you will live. And you, in turn, as you become an adult, will have to help determine the actions which must be taken in order to have a clean, wholesome, livable world for your children.

To do that, you need to know and to understand our environmental problems. You need to know what your government is doing to make and keep the world a good place in which to live, and you need to know what you can do to help. That is why the U.S. Environmental Protection Agency is publishing this book.

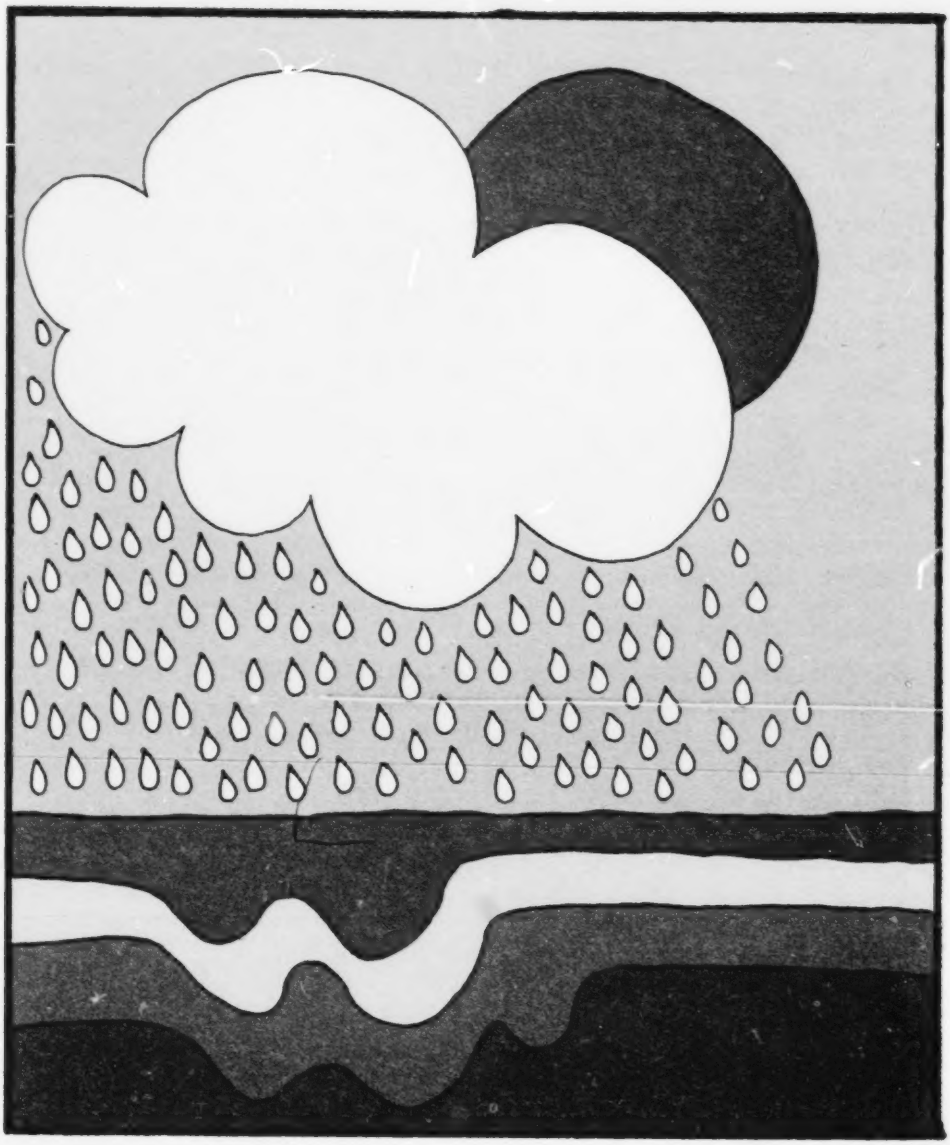
You will find that there are many ways you can help to improve the environment now. In your own town and neighborhood, for example, people of all ages can join the fight against litter in our parks, playgrounds and streets. Each of us can help protect the plants and trees that purify our air. Each of us can avoid the wastefulness that adds to our ugly, unsanitary dumps and uses up our valuable resources. Each of us can demand that standards and regulations for pollution control be set and enforced. We are sure you and your classmates will be able to think of many more ways in which you can become good environmentalists. And if you start now, you will be able to intelligently and responsibly participate in the many difficult decisions your generation will have to make about the environment.

Some of these decisions will be personal ones—such as which product to buy, what to repair and what to throw away, how to take care of your own house and property. Others will be public decisions—about laws and regulations and government policy—that affect the lives of all. But, make no mistake, they will be *your* decisions.

We constantly must remember, that in our nation even the biggest and most important decisions are really made by all of us, acting together as a government "of the people, by the people and for the people."

So it's up to us! It's your world and my world, and only we can make sure that it's a good world.

WILLIAM D. RUCKELSHAUS
ADMINISTRATOR



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Earth Is a Spaceship

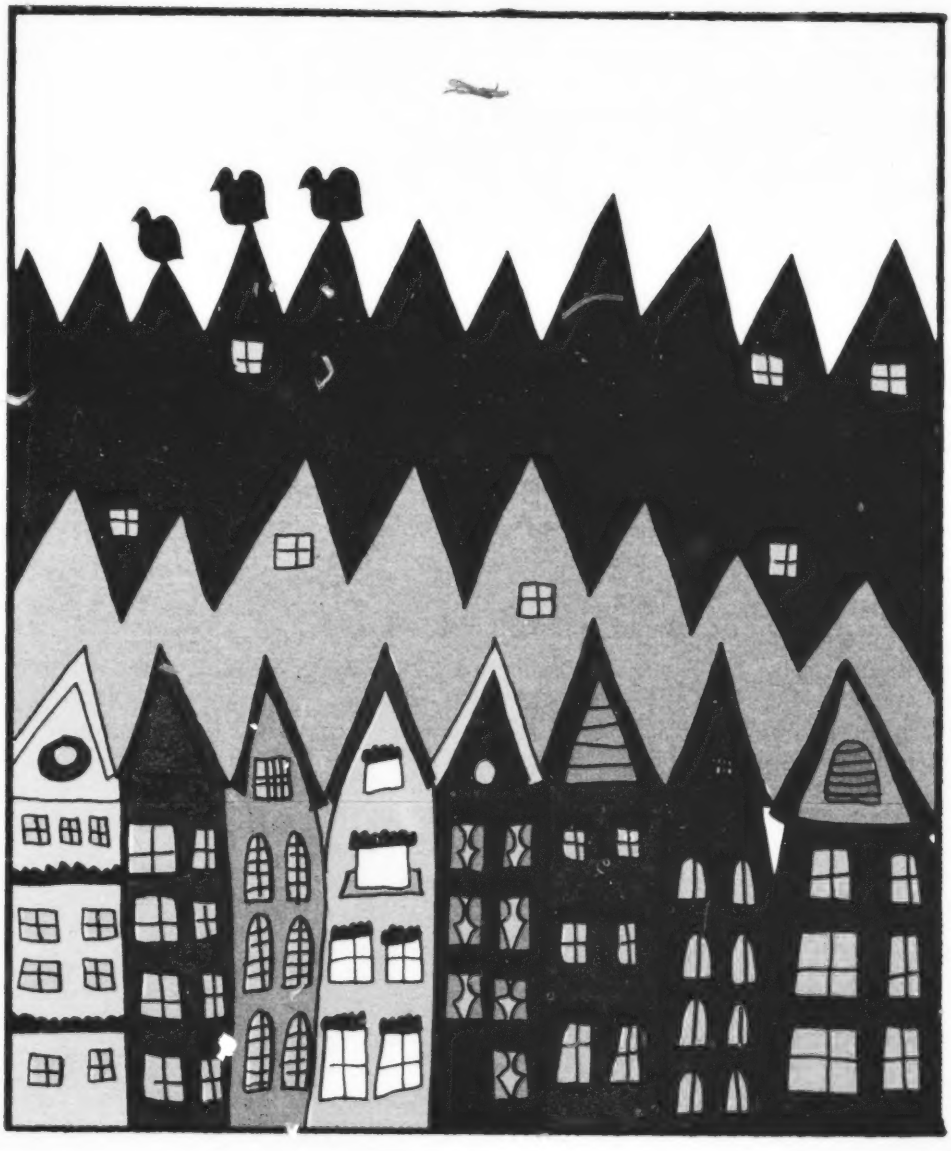
Have you sometimes wished you could go with the astronauts on a trip into space? Well, all of us really are on a spaceship—the earth itself. At this very moment, Planet Earth is moving around the sun at more than 18 miles per second. On board are nearly four billion people and a limited supply of air, water and land. These supplies—just like the air in the astronauts' spaceship—must be constantly used, purified and reused, for that's all there is, there is no "space shop" where we can get new supplies.

In proportion to the earth's size, the layer of air that surrounds our globe is no thicker than the skin on an apple. A shallow crust on the earth's surface has all the soil and water that will ever be available to earth's people. This tiny envelope of air and this crust of earth and water are called the biosphere—that part of our world that makes life possible. This is the environment on which our lives depend.

The biosphere is a "closed system" because nothing new is ever added. Nature recycles all things and uses them again and again. Water, for example, evaporates and floats in invisible droplets into the air to make clouds. Sooner or later, this same water comes back to earth as rain or snow or hail or sleet. It nourishes the plants and trees. It trickles over rocks and into the rivers where oxygen in the air helps to remove impurities it may have picked up on its way. The rivers flow into the oceans, and the great water cycle begins again. The rain that falls on your house is actually the same water that fell on dinosaurs 70 million years ago.

You probably know other ways in which this great natural recycling works—how the air is purified by trees and plants and how fallen leaves and other natural "wastes" nourish the soil for new crops.

Today, Spaceship Earth is in trouble because of the careless way we have used our limited supplies. Thousands of years ago there were few people on earth, and they lived simple lives of hunting and fishing. They did little to affect their environment. But the number of people increased. And as the years passed, we learned to make greater use of the earth's resources.



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We took such things as wood and metals and various chemicals and combined them in new ways to make things like refrigerators, automobiles and airplanes that are supposed to make our lives easier and pleasanter. We built great cities. We learned to grow great amounts of food by using chemical fertilizers and pesticides. We made medicines to heal the sick. We learned how to produce energy for light and heat—from coal, oil and even nuclear fission. But what we failed to realize was that, in doing all these things, we were actually rearranging things on Spaceship Earth in ways that interfere with its system of recycling and purification.

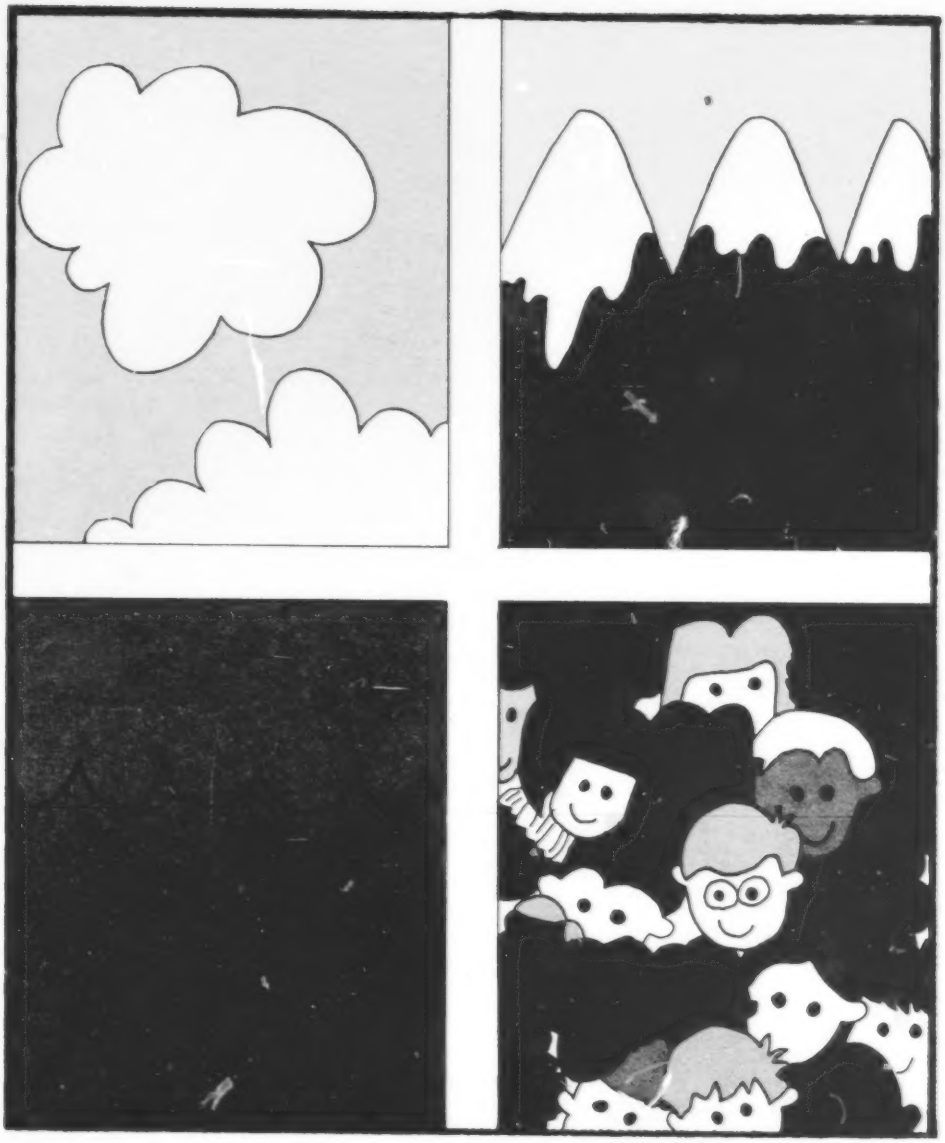
Now we are pouring back into our land, air and water more wastes than nature's system can handle. Some of these are different kinds of wastes that resist the natural recycling process. So we have pollution. And along with pollution, we have many other unpleasant changes in our environment—unusable water, land erosion, noise, smog and ugliness.

These things not only make the Earth less pleasant, but they also endanger fish, birds and other wild things that share our world and that are important to us. And pollution is a real threat to human health and well-being. Indeed, many scientists believe that, if we do not soon change our ways, the earth will one day become so polluted that human beings will no longer be able to survive on it.

We must change our habits. Of course, we have to go on using the air and water and the earth's resources; we need these for food and shelter, as well as for other products that make our lives comfortable and convenient. But we must learn to use these resources without destroying them.

We have to stop dumping our wastes into the air and water. We have to begin recycling paper, metal and other valuable materials. Many things we now throw away are made from resources that can be reused, but never can be replaced. Even the smoke you see coming out of stacks often contains chemical substances that have important uses in industry; many can be recaptured and used instead of being expelled into the air where they are harmful.

If we want to save Spaceship Earth, we have to learn to cooperate with nature—by using, but not abusing, the environment on which our lives depend.



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What EPA Is and Does

The U.S. Environmental Protection Agency (EPA) was established on December 2, 1970 to lead the Nation's fight against pollution. It reports directly to the President.

It is in charge of Federal programs to control air and water pollution and other environmental problems caused by solid wastes, pesticides, radiation and noise. Its authority to control pollution by setting standards and enforcing regulations is made possible by the various laws passed by Congress.

The President, with the consent of Congress, decided it was best to have a single, independent agency so that all environmental problems could be considered as a whole. In this way,we can be sure that in reducing air pollution, for example, we don't add to water pollution or make some other environmental problem worse.

All levels of government and all our citizens must join the effort to save our environment. To help them, EPA has set up 10 regional offices in different parts of the country. EPA's regional office specialists are experts in pollution prevention and control. They also know a lot about the problems of their area. The list on page 48 tells you which regional office serves your State.

Here are some of the important things EPA does:

- **It is our Federal environmental "policeman."**

EPA makes people stop polluting by setting and enforcing environmental standards. This is important because the standards define the kinds and amounts of pollutants that must be kept from entering our environment.

The standards also set up timetables for cleaning up pollution. Sometimes they say everyone must immediately stop putting a particular chemical into air or water or on crops and fields; this is done if the pollutant is dangerous. If there is no immediate danger, some time may be allowed to install machinery in manufacturing plants or make other changes to remove the pollutant.

For some types of pollution EPA has a lot of authority to set standards and enforce them; for others, most authority is with the State or local governments. It depends on the nature of the problem.

In general, Congress decided that strong Federal authority is needed to curb pollution that crosses State boundaries (as air and water pollution often do), or where it would be difficult for the States to make or enforce the laws (such as in making sure all new cars are low-polluting). Problems, like keeping streets clean or collecting garbage or building parks, are handled by State and local governments.

But on the big problems of national pollution, EPA makes sure that the same rules are followed all over the country. It uses the best research and knowledge available to decide what is harmful in the environment and should be banned or limited.

• **It finds out new things about pollution and pollution control through research.**

EPA studies our air and land, our rivers, lakes and oceans, to find out just what pollutants are there and where they come from. There are so many things released into the environment that it is hard to keep track of exactly what they are and how they all interact with each other.

It also does experiments in its laboratories to find out what effect pollutants have on our health and on plants and animals. It studies the findings of other scientists all over the world, too. This is how it determines what and how standards should be set.

EPA also develops new methods for controlling pollution such as ways of purifying sewage water, keeping harmful smoke and gases out of the air, preventing oil spills and recycling trash and garbage.

The agency has four National Environmental Research Centers—at Cincinnati, O.; Research Triangle Park, N.C.; Las Vegas, Nev., and Corvallis, Ore. There are also 36 other EPA laboratories that do special kinds of research, such as the effects of pollution on shellfish, the control of pollutants from automobiles, the effects of radiation on human health and many more. In addition to its own work, EPA has universities and other scientific institutions doing research.

• **It helps State and local governments.**

EPA helps State and local governments fight pollution by sending them the new information it develops through research, especially about ways to control pollution. The people in the regional offices are always ready to help solve pollution problems. EPA gives money to help run State and local environmental control programs and to construct sewage treatment plants. It

also provides money to cities, counties or States to build experimental facilities that demonstrate new ways of controlling pollution; these are called demonstration grants.

- **It trains more pollution experts.**

Because many highly skilled people are needed to solve environmental problems, EPA conducts short-term schools for employees of State and local governments and industry in control techniques and pollution program management. It gives fellowships to students for advanced training in the environmental sciences, and it supports the teaching of environmental courses in universities.

- **It helps citizens be good environmentalists.**

EPA thinks it is very important that everyone has the information needed to make decisions about the environment right in his or her own community.

It holds many public hearings before various standards and regulations are made final. At these hearings, anyone who wishes can come and say whether he thinks the standards are good or necessary, and suggest changes. Citizens can also attend local town council and zoning board meetings where important environmental decisions are made. They also must vote on State laws and local bond issues that affect pollution control, and they have to judge how different candidates for public office will decide environmental matters. Private citizens may even file lawsuits against polluters and against the government. So every citizen should know all he can about what is good and bad in the environment. EPA helps here too, by making available booklets, films and other information on environmental problems.

You make environmental decisions every day. The moment you decide what to do with an empty candy wrapper or soft-drink bottle, you have made an environmental decision. When you help plant a tree or a shrub or go out to spray the insects in your garden or burn leaves, you are making an environmental decision. Each of us makes many such decisions every day. Some are easy, others are complex, and it is hard to make the better choice unless we have all the facts.

So EPA tries to make all its scientific information widely available and understandable to help people to make sensible choices about the kind of environment they want, and what they must do to get it.

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- **It helps other Federal agencies work for a better environment.**

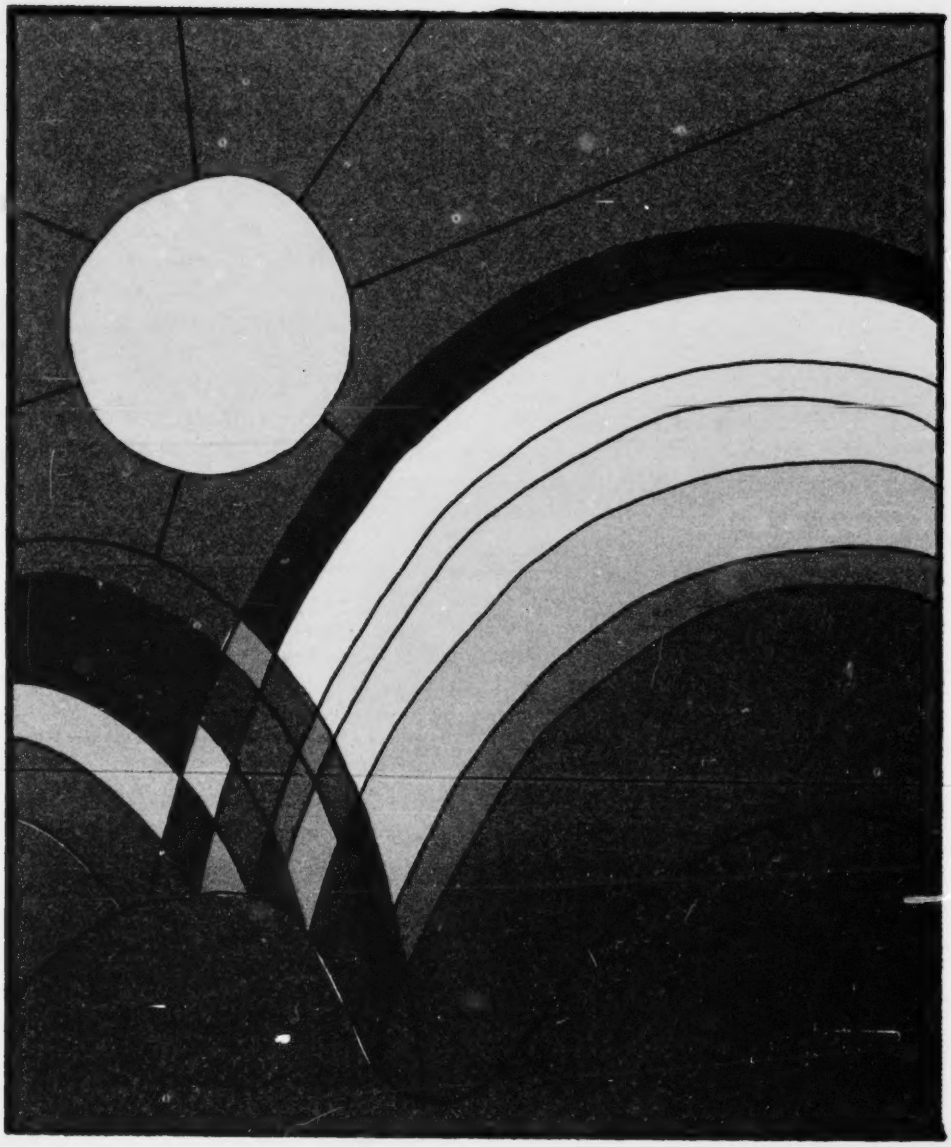
When you stop to think that the environment is practically everything, you realize that almost anything we do affects the environment in some way. You can see that EPA cannot be in charge of the whole environment.

Other government agencies take many actions that help determine the kind of world we live in. From your study of government, you know that one department is concerned with agriculture. Others are responsible for dams, highways or airports. Still others are concerned with parks, forests and wildlife, maintaining our harbors and other things that affect the environment.

The National Environmental Policy Act was designed to make sure that all departments of government work towards the same purpose. Whenever a department is planning any major project, it must think about whether it will affect the environment. Under the law, each Federal agency must prepare a statement that tells in advance what affect the proposed action will have on the environment. This is submitted to the President's Council on Environmental Quality and is reviewed by EPA and other agencies.

The National Environmental Policy Act, signed into law on January 1, 1970 said that the United States intends to "maintain conditions under which man and nature can exist in productive harmony and fulfill the social, economic and other requirements of present and future generations of Americans."

Other nations are also concerned about changes in their parts of the world, and efforts are under way for a cooperative worldwide fight against pollution problems. EPA already works with many other countries to make our country a better country and our world a better world.



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We Need Clean Air

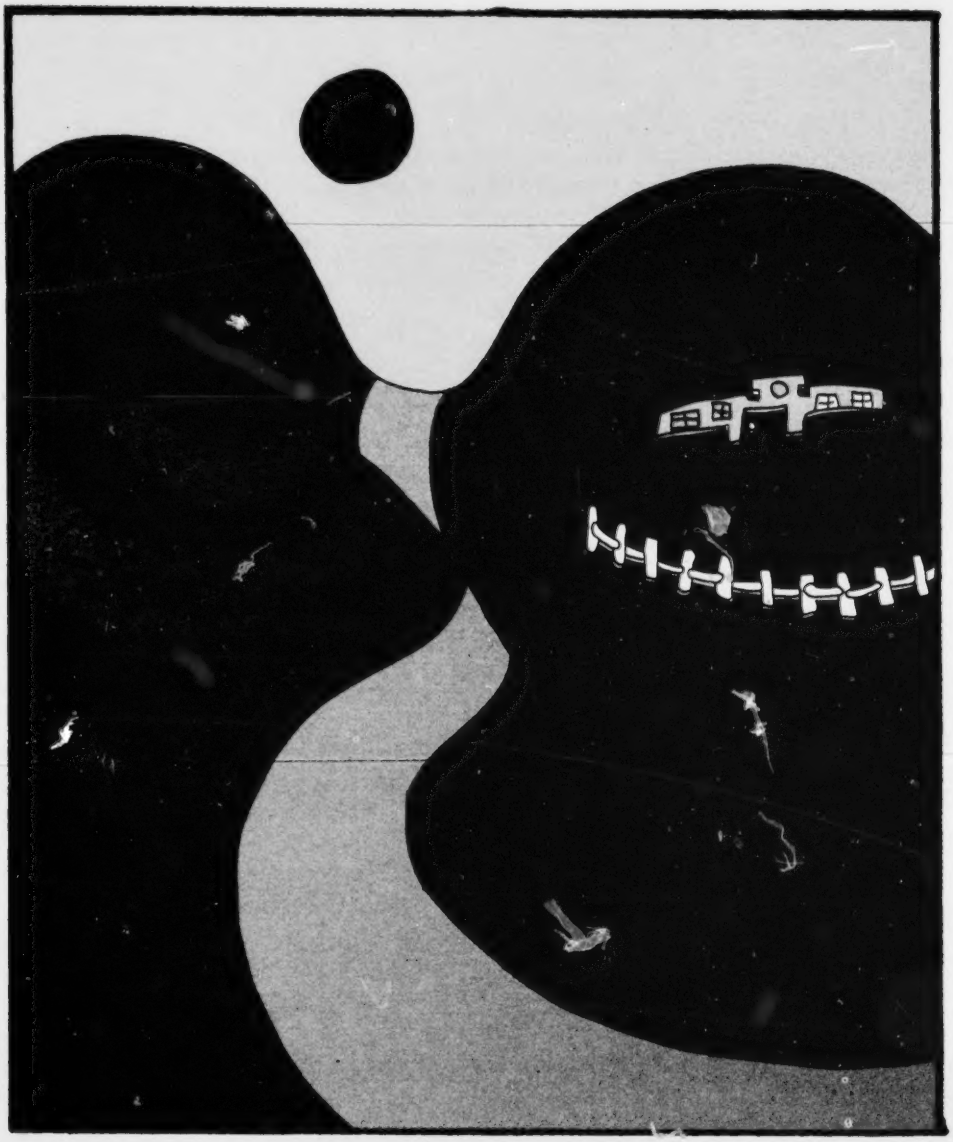
The dark smoke you see coming out of stacks or from a burning dump, contains particulate matter—that is, tiny particles of solid or liquid matter. This is a form of air pollution; but there are also many gases, most of which are not so visible. Altogether, they make up the serious air pollution that, in so many places, keeps us from seeing the sun and often irritates our eyes or causes us to cough or makes us ill.

Every year, over 280 million tons of wastes are released into the air over the United States. (You must not forget that gases—even ordinary fresh air—have weight). This is where they come from:

- 51 percent from transportation (chiefly the internal combustion engines that power our automobiles and planes)
- 16 percent from burning fuel in furnaces and power generators
- 14 percent from industrial processes
- 4 percent from burning of trash and other solid wastes
- 15 percent from forest fires and other miscellaneous sources.

Among the main classes of pollutants, in addition to particulate matter, are sulfur oxides, carbon monoxide, hydrocarbons and nitrogen oxides. Sometimes these combine in the atmosphere to form new classes of pollutants. By the action of sunlight, nitrogen oxides can combine with gaseous hydrocarbons to form photochemical oxidants. These sting the eyes and have other harmful effects. They are an important part of the famous Los Angeles "smog." That city has lots of sunshine, as well as frequent "temperature inversions" that keep pollutants from rising and trap them in stagnant air. Photochemical oxidants may form a brownish haze over your own city, especially in nice weather and in times of high auto traffic.

Air pollution can spread from city to city. It even spreads from one country to another. Some northern European countries have experienced "black snow" from pollutants that have traveled through the atmosphere from other countries and fallen with the snow. So environmental pollution is really a global problem.



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When air pollution is bad, it can be a killer, especially of babies, old people and those who have respiratory diseases. In London, in 1952, four thousand people died in one week as a result of a serious air pollution episode. In 1948, in the small town of Donora, Pa., 20 people died in a four-day period of bad air pollution.

We know that at levels frequently found in our cities, air pollution increases the incidence of certain lung diseases, such as emphysema, bronchitis and asthma. Of course, smoking and other factors help to cause these ailments, too, but these cases have increased dramatically during recent years as air pollution has become worse.

We know, too, that air pollution can cause both airplane and auto accidents because it cuts down visibility.

But there are other possible health dangers from air pollution that we don't know much about. For example, scientists are now trying to determine whether certain chemicals that reach us from the air may create changes in our cells, changes which might cause babies to be born with serious defects. There are many other things we are still trying to learn more about; one is how all the many chemicals we are apt to take into our bodies from air and water and food and even medicines act together to affect our health and the way our bodies function. That is another reason why it is so important to begin to control pollution now instead of waiting until we learn all the answers about just how bad it could be.

Have you ever considered just how much money air pollution costs us now? It soils and corrodes our buildings. It damages farm crops and forests. It has a destructive effect on our art treasures. The cost of all this damage in the United States is estimated at more than $16 billion every year—far more than the cost of controlling air pollution would be.

The Federal government began to do research on air pollution in 1955. In 1963 Congress passed the Clean Air Act which authorized financial help to State and local air pollution control programs. Later the Clean Air Act was amended to give some new ways to fight air pollution. But it was only in 1970 that Congress authorized EPA to establish national air quality standards. This was an important change, because it meant that all parts of our country have to clean up their air to meet the national standards.

This is the way your Government is now fighting air pollution:

- EPA established national air quality standards in 1971. They define

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just how much of the principal pollutants will be allowed in the air. First, they tell the maximum amount of each pollutant that can be permitted in order to protect our health; these are primary standards. Next, they tell the maximum amount of each pollutant that can be permitted to prevent other undesirable effects; these are secondary standards.

• All of our States and territories must now clean up their air to meet these national air quality standards. Each State has developed a plan which is to insure that the primary standards (those required to protect our health) will be met by the middle of 1975. Some extra time will be permitted to make the air clean enough to meet the secondary standards. These State plans are called implementation plans, and they must all be approved by EPA. If any State should fail to do the things required by its implementation plan, EPA can step in and see that they are done. So, if you live in a badly polluted area, you should begin to notice a big improvement in the air you breathe within the next few years.

Find out what is being done in your own community under your State plan to clean up the air. Probably open burning is no longer permitted. Factories, power plants and incinerators may be required to install control equipment or close down. Perhaps there are plans to limit automobile traffic in certain areas or during certain hours, because auto exhausts contribute so much pollution. If so, this may mean that public transportation—bus, train or subway—will have to be improved, and people may have to use more carpools. Some people won't like changes of this sort, but they should change their minds when they see how much cleaner the air will be.

• To make sure that new plants and factories, or those that are being enlarged or changed in some way, do not pollute, EPA has established and will enforce emission standards for certain industries. These require such plants to use the best possible methods to keep pollution down to an absolute minimum. They are different from the air quality standards because they tell the plant exactly what may be allowed to come out of its stacks.

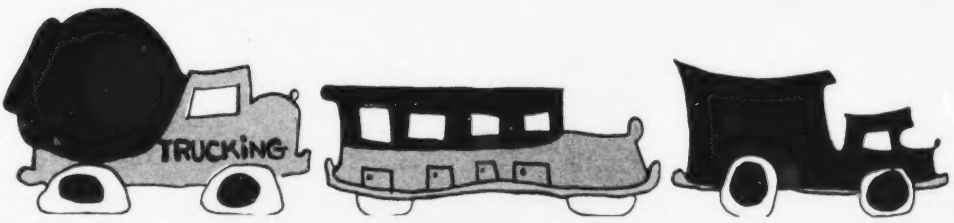
• Certain pollutants are known to be extremely harmful to human health. Among these are beryllium, mercury and asbestos. EPA has proposed emission standards for such pollutants which must be observed by all plants, old or new.

• Automobiles are among our worst polluters, so EPA establishes and enforces emission standards for all new model cars. Since 1968, all new cars have been required to reduce pollution levels. The newest standards require that, by 1975, the carbon monoxide and hydrocarbons in auto emissions be reduced by 90 percent below 1970 model cars, and that nitrogen oxides from 1976 models be 90 percent less polluting than the 1971 models. During 1972, emission standards for aircraft are also being established.

The best answer to auto pollution would be to develop power sources that don't emit harmful pollutants. Some engineers are working to make the gasoline internal combustion engine—the kind most cars now use—non-polluting. Others believe the best solution would be a different engine altogether. EPA is doing research itself, as well as encouraging others to develop a truly non-polluting vehicle.

Of course, even if we had a non-polluting car today, there would still be lots of old cars on the road, so we would still have pollution from this source for some time to come.

You can see that we can't cure air pollution just by ordering everybody to stop polluting. If we did that, most of our factories and power plants would have to close down, and we couldn't even drive our cars. But we can clean up our air in the next few years if we are all willing to change our ways of doing things—ways that cause air pollution—just as quickly as we can.



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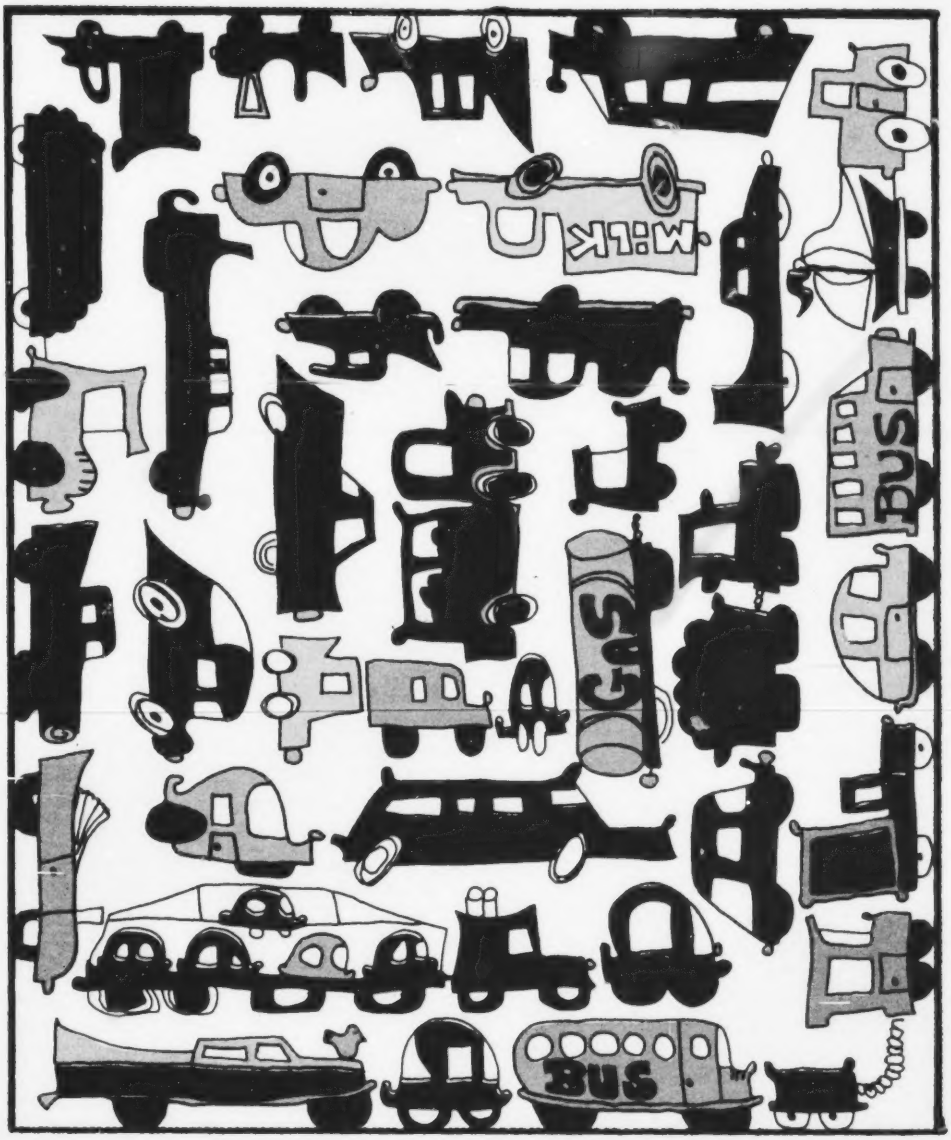

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We Need Clean Water

Not so many years ago, most streams and lakes in America were sparkling and clean. People could swim and fish in them without being afraid of becoming sick. But as our nation grew bigger, we built towns and factories on the banks of these streams and lakes, and every year we dumped more and more wastes into them. People thought that the water would carry the wastes away and purify itself. This was true when the amount of wastes was small, but as our population has grown, the greater amounts of wastes have not been properly handled.

What we have done is to overload the natural water recycling system of Spaceship Earth. Now most of our streams and lakes show some signs of man's abuse, and many are grossly polluted. The Cuyahoga River in Ohio, for example, had so much rubble and oily pollution in it, that it actually caught fire a few years ago.

Did you know that lakes can die? One of our beautiful Great Lakes—Lake Erie—is not dead, but it is in serious trouble as a result of what is called eutrophication or aging. This is a natural process for all bodies of water, but it is speeded up today by man's pollution. Certain pollutants, including the phosphates, for example, stimulate too much plant growth and otherwise disturb the ecological balance of the lake. According to scientists, pollution has aged Lake Erie many years in a relatively short time. To save it, we must stop dumping wastes into the Lake and take positive action to clean it up.

Marine scientists have found that even the ocean depths show the effects of pollution. And in shallower waters near our coasts, contamination prevents the harvesting of fish and shellfish in many areas. Oil—accidentally spilled or even deliberately dumped in the ocean—has become a big problem because it spoils our beaches and destroys fish and sea birds.

The water that we drink is ordinarily taken from the best and least polluted source, then treated to make sure it is safe for drinking. But you can see that with so much pollution, it gets more difficult to find good water and to make sure that it is properly treated. Even water far below the ground, from which many cities get their drinking water, is sometimes polluted by poisonous wastes seeping into the soil.

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Where does all this water pollution come from? Here are some of the most important facts:

- More than 1,416 communities discharge their sewage into waterways without any treatment whatever. And more than 2,300 communities use just primary treatment, which removes only 30 to 40 percent of some pollutants. Within your lifetime, sewage wastes in the United States are expected to increase by nearly four times. So you can see how important it is to build better, more advanced sewage treatment plants that can remove almost all contamination.
- The largest amount and the most poisonous of pollutants come from industrial plants. There are about 240,000 plants that use water to carry away all kinds of chemical wastes.
- Big oil spills from vessels and from off-shore drilling have caused serious damage. In addition, smaller amounts, totaling thousands of barrels of oil, are wasted or spilled every day in streams and lakes across the country.
- Huge feedlots, contained areas where thousands of cattle or other animals are fattened for the market, cause a problem because animal wastes seep into the ground and get into waterways.
- Fertilizer and pesticides run off from our fields and forests.
- Wastes from mining operations drain into the water.
- Water, principally used to cool electric power generators, is put back into streams still hot from the power plants. This thermal pollution often changes plant and animal life by raising water temperature.
- Sewage from big ocean liners and small pleasure boats is dumped into our waters. Leaking gasoline and oil from boat motors are also pollutants.

The Federal government began its efforts to clean up the Nation's waters in 1948. The early Federal program was amended several times over the years and was then revised and greatly strengthened by Congress in 1972. Here are some of the ways EPA now fights water pollution under the Federal Water Pollution Control Act:

- EPA gives money to communities to help them build sewage treatment plants.
- EPA helps train men and women to design and operate sewage treatment plants.
- EPA gives money to the States to help them carry on their water pollution control programs.

• EPA establishes various standards to make sure that water pollutants from factories and community sewage treatment plants do not harm our health. The standards also seek to protect our water supplies; to protect fish and wildlife that live in or depend upon water; to make and keep the water clean enough for swimming, water skiing and boating; and to make sure that industries and farmers have water that is safe enough to use in manufacturing the products and growing the food we need and want.

Some standards set limits on the amounts of pollutants that may be discharged into the water. Some standards define how factories and sewage treatment plants can operate with a minimum of water pollution.

• Some pollutants are so dangerous that they are never allowed to be discharged into the water, in any amount. These include radiological, chemical and biological warfare materials and high-level radioactive wastes.

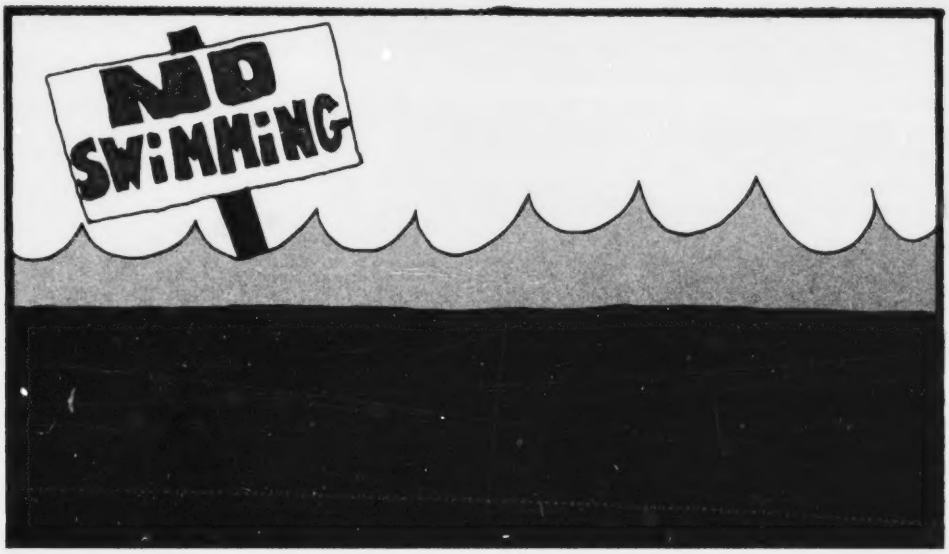
• To make sure that clean water will be achieved, the Federal law prohibits discharges of pollutants into the water without a permit. Permits are issued by EPA, or by a State government if EPA approves the State's permit program.

The permit is a most important part of the water pollution control program, for each permit applies various standards to a specific polluter. The permit tells a polluter what pollutants, and how much, he may discharge into the water. If the polluter cannot meet the standards immediately, the permit tells him exactly when he must do so over a period of time.

A permit for discharging pollutants is like a contract between the government and a polluter. It requires the polluter to reduce his discharges to meet government standards. It contains clear deadlines for action. And all permits are made public, so anyone can find out if polluters are living up to the conditions of their permits on schedule.

• EPA also sets standards to control sewage discharges from ships and boats (except small ones, like canoes and rowboats). EPA also sets standards for the cleanup of oil spills and other hazardous substances, and EPA can require anyone spilling oil or other hazardous materials into the water to pay the cleanup costs.

• Anyone violating the water pollution control law may be fined up to $25,000 a day and be given one year in prison. In emergencies, EPA has the power to take whatever action is necessary to stop or prevent water pol-



lution that is an immediate danger to people's health.

• In addition, under another law, EPA regulates the dumping of wastes into the oceans to protect human health, to safeguard the ocean environment and its ecological systems, and to protect the recreation and scenic values of the ocean. And under still another law, EPA recommends standards for drinking water supplies, to help cities and towns keep their drinking water safe.

In general, EPA's water pollution control programs require polluters to use what the law calls the "best practicable" technology for controlling water pollution by July 1, 1977, and then to use the "best available" control methods by July 1, 1983.

The combination of strict standards, good technology and fair but firm enforcement should enable the United States to achieve two goals established by Congress for our waters. The first goal is, wherever possible, water that is clean enough for swimming and clean enough for fish and wildlife by July 1, 1983. The second goal is no more discharges of any pollutants into our streams, rivers, lakes and oceans by 1985.

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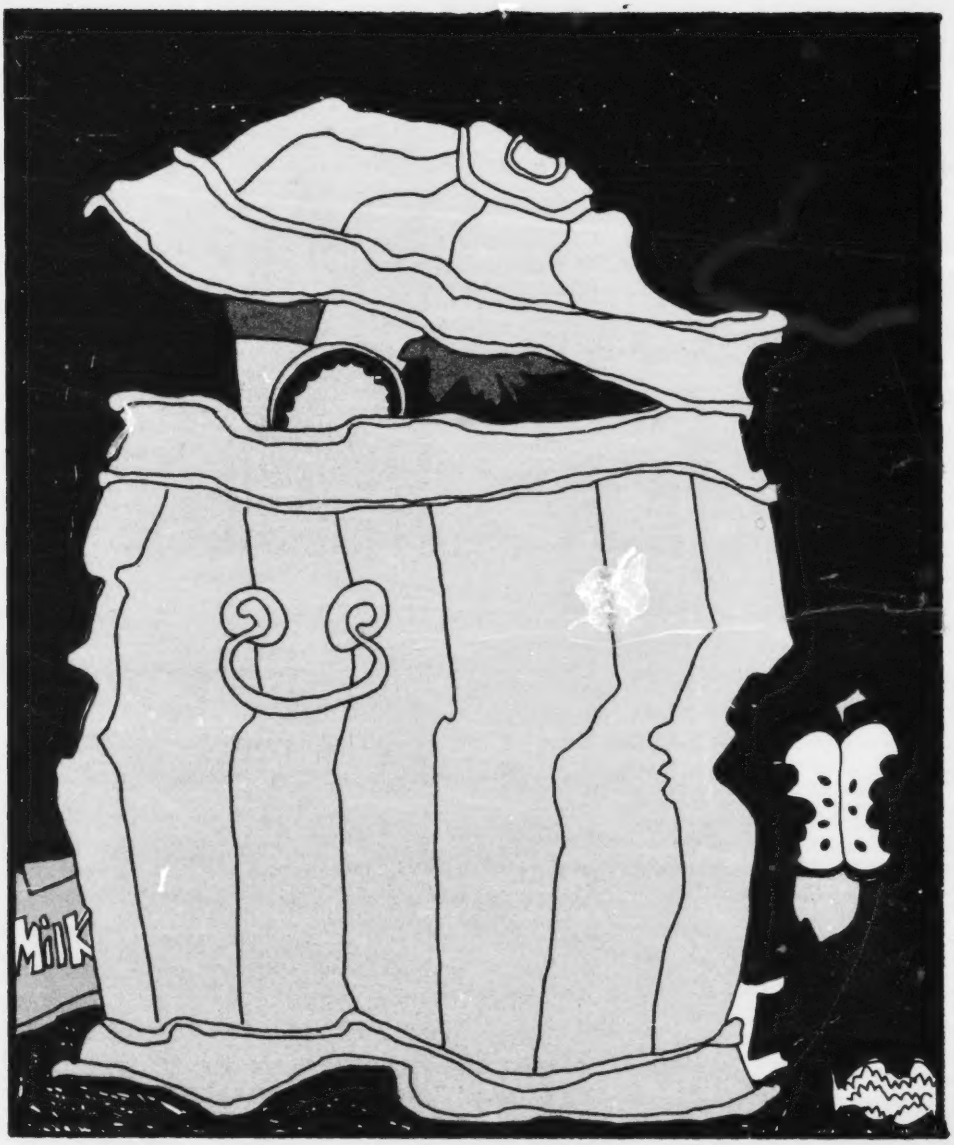

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The Things We Throw Away

Even the earliest cavemen had some things to throw away. Their discarded stone tools, and the charred remains of their cooking fires which sometimes are found today show us what their life was like. Of course, not much remains because most of what they threw away was animal or vegetable matter that quickly returned to the earth by nature's own recycling system.

Even our early American ancestors didn't have to worry much about disposing of trash. They wasted very little, and their wastes were largely simple, natural materials. But our lives are different today, and the problem of getting rid of wastes (we call it solid waste management) has become a difficult one to solve.

America now has a large population, much of it gathered in large cities. Every year we manufacture, use and throw away more and more. And today much of what we throw away does not, in fact, go "away" because it is made of materials that decay slowly or not at all. Our annual "throw-away" includes 48 billion cans, 26 billion bottles and jars, 4 million tons of plastic, 7.6 million television sets, 7 million cars and trucks and 30 million tons of paper.

Much of what we throw away winds up on some open dump. If a dump is allowed to burn, it pollutes the air. Liquids leaching out of dumps pollute water. And, of course, a dump is a good breeding place for disease-carrying rats and insects. Open dumps are ugly, smelly and unsanitary. Besides that, most cities and towns are running out of places to have a dump—nobody wants one near his house.

Some cities have big incinerators for burning trash and garbage, but most of these now must add pollution control equipment because they pollute the air. Quite a bit of our trash, as you can see, is not collected at all but litters our roads and sidewalks and makes our countryside ugly.

Today, we are looking for better methods of disposing of things that cannot be reused. Also, we are determined to find ways to recover and reuse

valuable resources. That is why ecology-minded citizens are setting up recycling centers for paper, cans and bottles in many communities. That is why the Congress passed a law called the Resource Recovery Act of 1970 to help us find new ways of managing our solid wastes.

How serious is the solid waste problem? Look at these statistics:

• Americans make up only 7 percent of the world's population but we use nearly half of all the industrial raw materials used throughout the whole world.

• The solid wastes produced in the United States now total 4.3 billion tons a year. Of this amount, 360 million tons are household, municipal and industrial wastes. In addition, 2.3 billion tons are agricultural wastes, and 1.7 billion tons are mineral wastes.

• Every year, 190 million tons are collected and hauled away for disposal at a cost of over $4.5 billion a year. This amount of trash and garbage amounts to about 6 pounds per day for each and every one of us. By 1980, it is expected to be 8 pounds per person per day.

EPA is trying to get communities all over the country to use better methods of collection and disposal that have been developed. It is also working on various ways to salvage usable materials and recycle them back into new products.

In Franklin, Ohio, for example, one advanced recycling plant takes all the city's garbage and trash, sorts it mechanically and salvages paper pulp and some metals. Glass and other metals will also eventually be reclaimed. This is one of EPA's demonstration projects to test the process to see if it can be used in other communities.

Other demonstrations show how solid wastes can be used as fuel to generate heat or power; this is a form of recycling since it recovers energy which is now thrown away. EPA is also developing and testing many other recycling ideas. Glass, for example, is being tested as a substitute for gravel in making asphalt or "glassphalt" for road surfaces. There are also ways of transforming old materials into new ones by chemical action. EPA is also trying to determine what changes might be required in taxes, freight rates and other economic policies to encourage more recycling and reuse of waste

materials. Right now, our production plants often find it cheaper to use new materials than recycled ones, so there are not enough markets for large amounts of salvage.

Our aim is to increase recycling as fast as we can so that eventually almost everything usable that we throw away goes back to be used again.

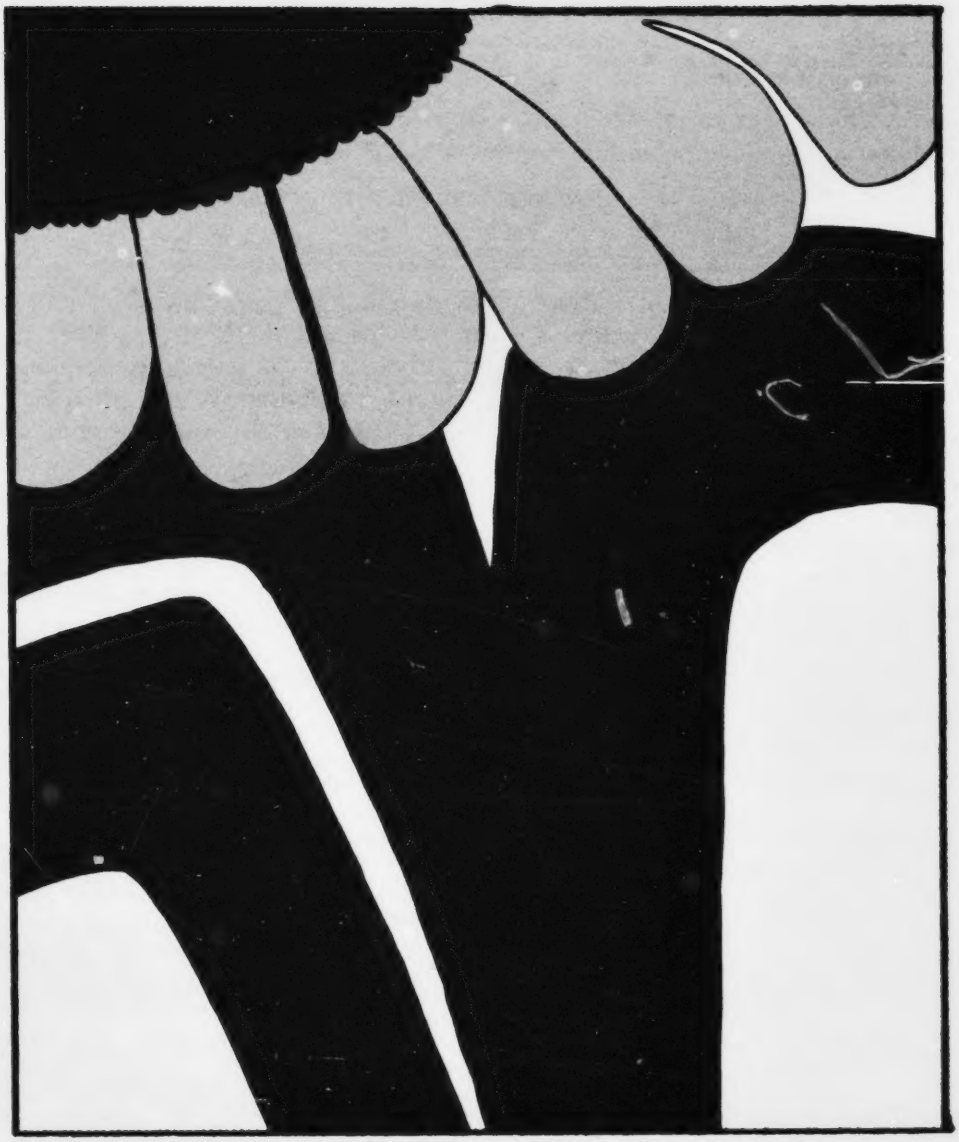
We must remember, however, that even if we recycled everything we could, we would still have the problem of disposing of wastes. We must, therefore, start using better methods of disposal right away.

One method of disposal that many communities can use is the sanitary landfill. In this system, wastes are compacted and covered with a layer of earth each day. Of course, the proper methods must be used to be sure the landfill is really sanitary and does not cause any pollution. When completed, such landfills are used for parks or other recreational uses, making them of more value to the community than before.

Pests—Some We Need, Some We Don't

Scientists tell us that there are from three to ten million known species of insects in the world, and thousands more are identified every year. Many of the known insects feed on living plants. Some, such as butterflies and moths in the larval stage, can seriously damage a whole field or forest; yet later, as adults, they carry the pollen that insures the growth of new plants. Some insects are harmful to man because they are disease-carriers, some are just unpleasant nuisances, while many others are beneficial because they destroy insects that cause damage.

In the United States, we have been using various chemicals for many years to control insect pests. Among the earliest insecticides were sulfurs and



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compounds containing arsenic. Light oils were often used to control mosquitoes. Later, man-made organic compounds (organic means they contain carbon) were developed. Some of these kill insects long after they are applied. Chemicals, called herbicides, were developed to control undesirable plant growth, and others, fungicides, to protect plants from diseases. Chemicals are also used to control pests such as rodents. By now, thousands of such pesticides in liquid, granule and powder form have been used in the United States. Many people probably use too much pesticide on the theory that "if a little is good, a lot is better."

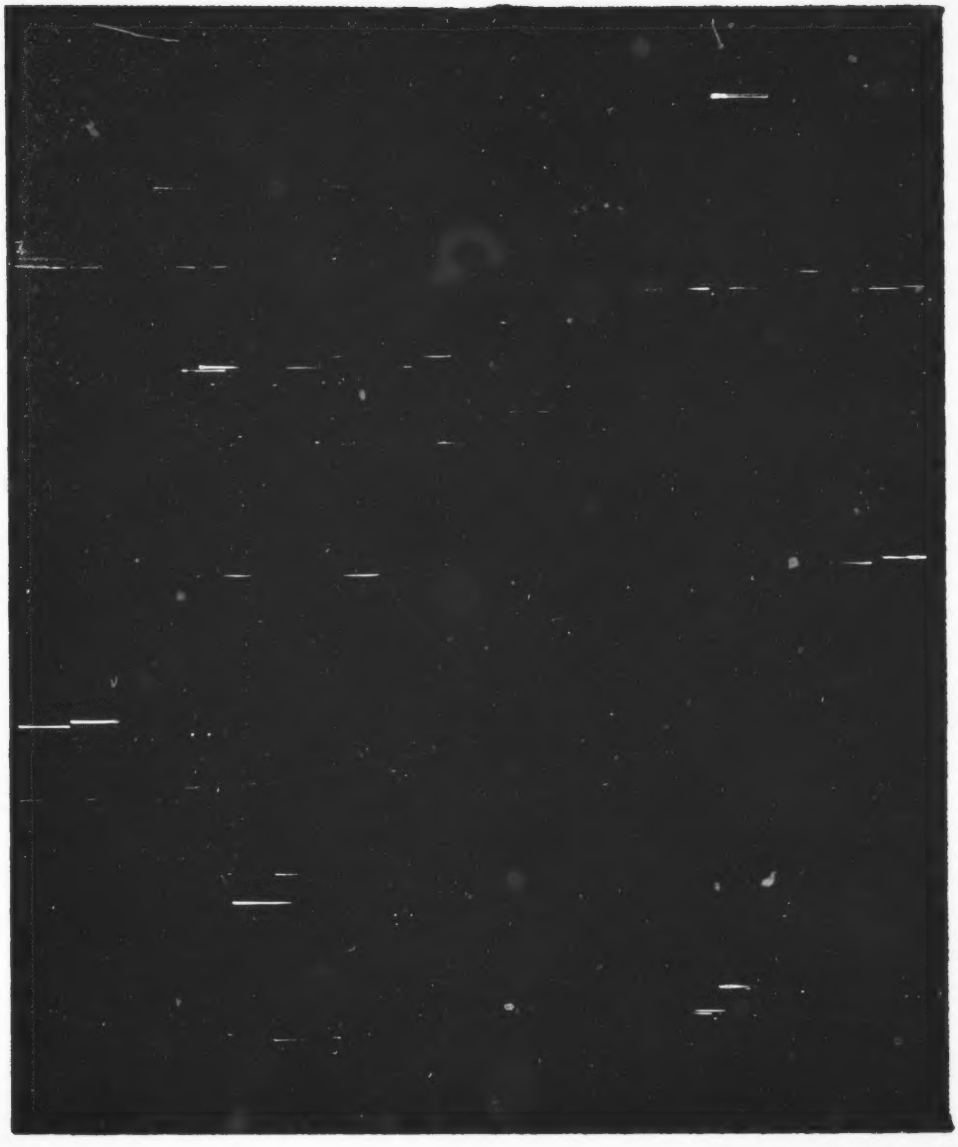
We know, of course, that these chemicals are beneficial. They have enabled us to increase food production greatly, and they have controlled such killing diseases as malaria and encephalitis. We know now, however, that some of these compounds may also seriously damage our environment.

Some of the newer pesticides are called persistent compounds because they do not break down readily in nature's recycling system. This is especially true of the chlorinated hydrocarbons such as DDT. They persist in the environment and eventually accumulate in the tissues of birds, fish, wildlife and even man. As larger species feed on smaller ones, more and more chemicals are concentrated in their tissues. Some predatory birds, fish and animals may accumulate levels several thousand times the concentration found in the water or air or plants around them because they receive all the chemicals stored by all the animals in their "food chain."

Man is at the top of this food chain, and the average American now carries about eights parts per million of DDT in his fatty tissues. We do not know if this amount is harmful to humans. However, we have known for some years that DDT kills fish and there is evidence that it threatens other desirable wildlife species.

For example, certain bird species now produce fewer offspring, probably because of pesticide accumulations in their bodies. Pesticides may cause birds' eggs to have thin shells which crush before babies can be hatched. The brown pelican and the peregrine falcon are among birds regarded as "endangered species" because so few young birds are now being hatched either because of pesticide residues or other environmental factors.

A large part of the pesticides we use finally reaches the ocean. It is estimated that about one-fourth of the world's entire production of DDT may be



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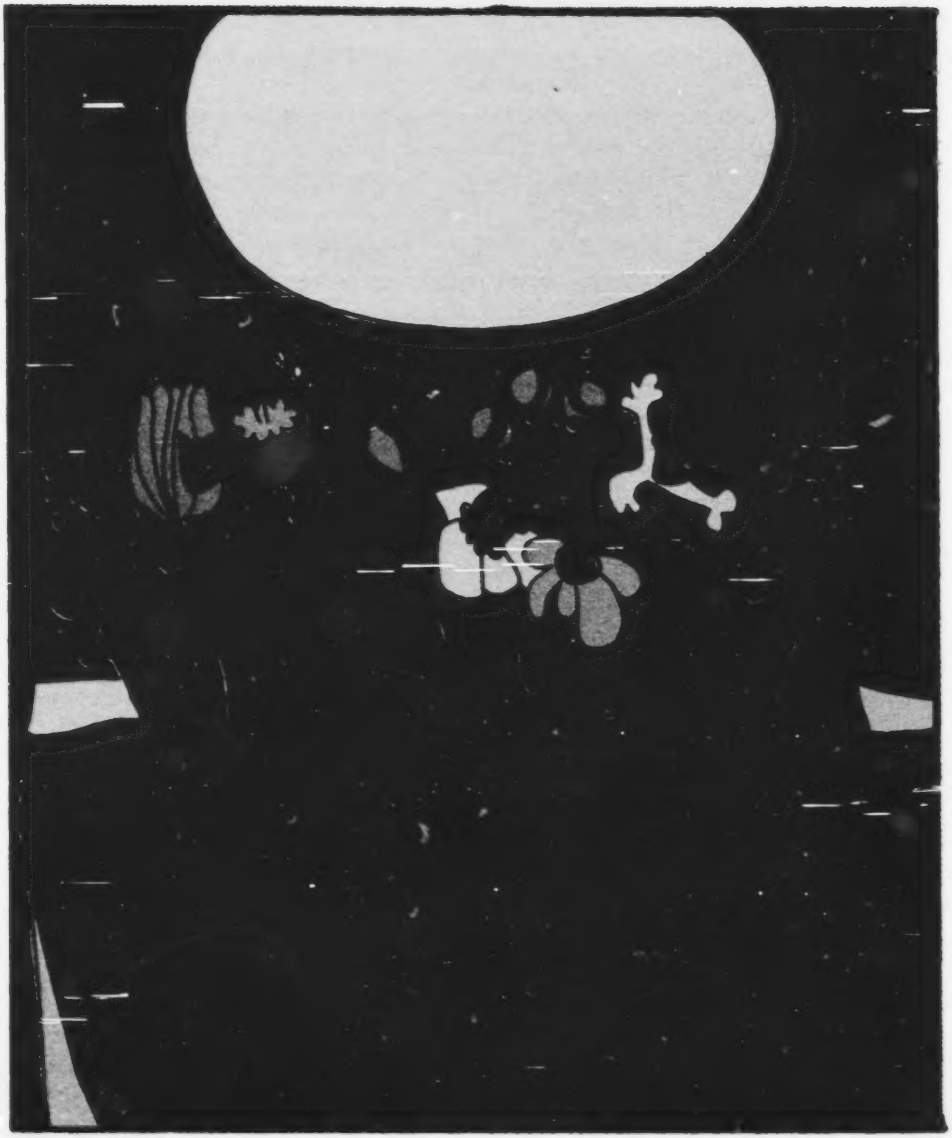
in the sea, and pesticide residues are found in almost all ocean fish. Some scientists believe that pesticide contamination is the reason that fewer shrimp, crabs and oysters now are found in certain areas.

Some of the newest pesticides are less persistent than others, but they are more poisonous. Some have caused accidental kills of both wildlife and humans. Of course, almost any pesticide can be dangerous if it is carelessly or improperly used. In fact, misuse of pesticides causes about 200 human deaths every year and thousands of cases of severe illness.

The Federal government began regulating pesticides in 1947, under the Federal Insecticide, Fungicide, and Rodenticide Act. That law was greatly improved by the Federal Environmental Pesticide Control Act of 1972. EPA now has the major responsibility to control pesticides under those laws and under a provision of the Federal Food, Drug and Cosmetic Act. Here's how:

- All pesticides and factories where they are manufactured must be registered by EPA.
- To be registered, a pesticide must be safe. When used properly, it must not have unreasonable adverse effects on the environment. It must be properly labeled, with clear directions for use. It must serve its intended purpose—that is, it must do what the label says it will do.
- If a pesticide meets EPA standards, EPA registers it and classifies it for "general use," for "restricted use," or both.
- A "general use" pesticide is one that will not cause unreasonable adverse effects on the environment.
- A "restricted use" pesticide is one that may adversely affect the environment or injure the person applying it. A "restricted use" pesticide may be used only by or under the direct supervision of a certified applicator. People trained to handle these dangerous pesticides will be certified by EPA, or by a State if its certification program meets EPA requirements.
- EPA continually studies the effects of approved pesticides to make sure they continue to meet all requirements. If problems develop, EPA is empowered to act. EPA can cancel a registered pesticide that damages the environment. In emergencies, EPA can immediately suspend the use of a registered pesticide to prevent an imminent hazard to people, to the environment or to an endangered animal species. EPA also has authority to seize and confiscate registered pesticides that are adulterated or misbranded, or



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that damage the environment. EPA can also seize and confiscate unregistered pesticides.

• EPA also sets standards to limit the amount of pesticide residues that can be in our food and in feed crops for animals. These safety limits—or "tolerances," as they are called—protect our health, and the health of animals, and are set well below the point at which pesticide residues might be harmful. The Food and Drug Administration, part of the Department of Health, Education and Welfare, enforces the tolerances and may seize any food that contains too much pesticides.

•Anyone violating the pesticide control laws may be fined up to $25,000, be sentenced to one year in prison, or both.

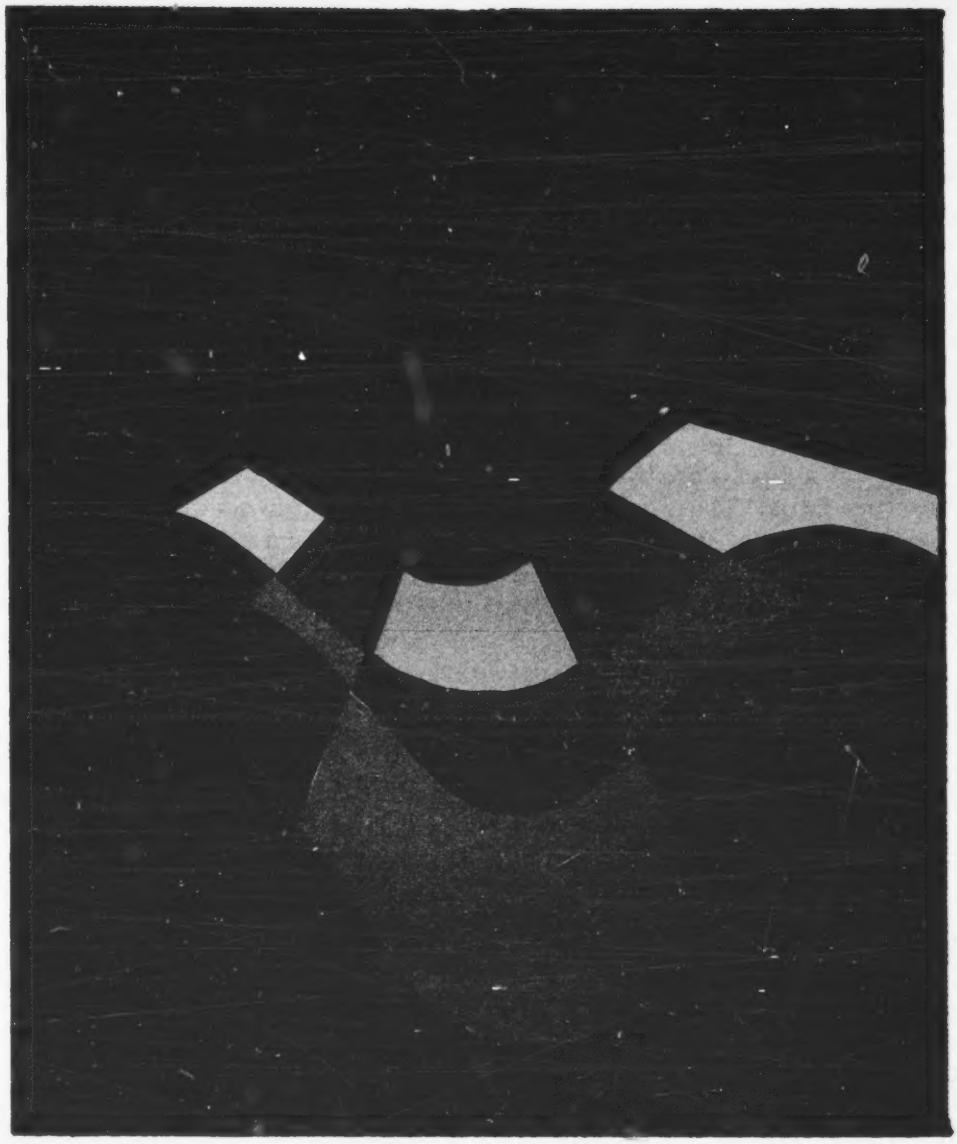
• EPA also monitors pesticides in the environment—in the air, soil, water, plants, and in man and animals. EPA also conducts research on the effects of pesticides on the environment, including humans.

Pest control is necessary if we are to have the food we need and to protect our health. Thus some chemicals will probably always be used to fight pests. However, a strange thing is happening. More and more insects are becoming immune to chemicals that once killed them. In some places, mosquitoes that carry malaria are increasing and are even more difficult to destroy than before

Scientists, in EPA and throughout the world, are therefore seeking other methods of pest control than the use of chemicals. It is known, for instance, that some pests that attack crops and livestock can be partly controlled by their natural enemies, called predators and parasites. Some plant varieties resist insect and disease damage better than others. Planting different crops at different times can also reduce pest infestations.

Scientists have also been able to sterilize some male insects by atomic radiation and thus prevent massive reproduction of those insects. Sound and ultraviolet light can also be used to trap and kill insects. And research is being done on the use of disease to destroy some insects by using viruses and bacteria to kill them. Research is also being done on the use of hormones to stop insect growth.

Eventually, by combining many methods into an integrated attack on pests, science hopes to sharply reduce the need for widespread use of chemical pesticides. Meanwhile, EPA seeks to make sure that the chemical pesticides we use are safe and will not endanger the environment.



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The Problems of Man-Made Radiation

There are many kinds of radiation but the one that interests environmentalists is radioactivity—radiation caused by man-made changes in the structure of the atoms of which all matter is composed. Changes in the atom release tiny particles of radioactive matter that can be harmful to man and other living things.

Man always has been exposed to radioactivity. It reaches us in cosmic rays from the sun and outer space. It is in the air, ground and rocks—all from natural sources. We have adopted units of measurement for it, called rems. In order to measure quantities smaller than a rem, we have divided it into 1000 parts, each of which is called a millirem.

People in different parts of the United States are exposed to natural radiation ranging from 100 to 250 millirems annually, with the average exposure about 130 millirems. In addition, the average person now receives about 77 millirems a year of man-made radiation because we use nuclear and electro-magnetic technology in many ways.

About 91 percent of man-made radiation comes from x-rays and other medical uses of this technology; some of us receive more than others, but medical radiation now accounts for about 35 percent of all radiation to which the average person is exposed.

Before 1963, nuclear bombs were tested in the atmosphere by our own and other countries. Fallout from these tests still accounts for about 5 percent of the man-made radiation to which we are exposed. In 1963, the United States and the Soviet Union agreed to stop testing these weapons in the atmosphere to help eliminate this problem.

Radiation comes from other sources—such as color television sets, luminous dial watches, microwave ovens, various processes used in research and industry, nuclear plants which generate electric power and the facilities handling the fuel for these plants.

About 23 nuclear power plants are now operable in the United States, and this number is expected to reach 100 by 1976. By 1985, there may be

as many as 200 to 300. Small amounts of radioactivity are released from these nuclear reactors in both gaseous and liquid form, and also from the plants where used fuel is processed for reuse. People living within a 50-mile radius of an operating reactor receive relatively little radiation exposure, less than one millirem a year on the average or less than one percent of what they receive from natural sources.

It is important to understand both the benefits and the risks of using nuclear technology. For example, our country needs and will continue to need a great deal of electricity. Nuclear power can generate electricity in almost unlimited amounts without using up scarce supplies of fossil fuels such as oil and gas and without the pollution that comes from burning these fuels. Because we need so much power, President Nixon, in 1971, announced that we would try to speed the development of a new type of "fast-breeder" nuclear plant to add to power production.

On the other hand, radiation can be hazardous to man. Any increase of radioactivity in the environment is believed to increase the risks to health, so we must try to keep man-made radiation exposures as low as possible.

We know quite a lot about the effects of large doses of radiation. They can cause leukemia and other types of cancer, as well as cataracts and other eye damage. Also, people who receive a large enough dose may not be able to have children, or they may show signs of old age earlier in life.

However, we still do not know very much about the long-term effects of low levels of radiation. One thing scientists are concerned about is the possibility that this might alter or damage human genes. Genes are the parts of our body cells that determine our inherited characteristics—that is, they cause us to look and act like our parents and ancestors. Damage to these genes could cause defects or other undesirable changes in the characteristics of newborn babies. Scientists believe that natural background radiation is one of the causes of natural mutation—that is, the gene changes that have, over many thousands of years, produced different races of men and different species of animals and plants. That is why we must be careful even about low levels of radiation exposure.

What about the risk of accident in a nuclear reactor which would release large amounts of radioactivity? All possible safety precautions are

built into the plants. For example, there are failsafe devices to compensate for human error, monitoring and control systems, and several layers of steel-lined reinforced concrete, one inside the other, to act as barriers to any accidental release of radioactivity. In nearly 20 years of nuclear development, no member of the public has been injured by the operation of a commercial nuclear power plant. But, of course, the possibility of an accident cannot be taken lightly.

Other problems of nuclear reactors are the disposal of radioactive wastes and the hot waste waters which, if not cooled before they are put back into a river or bay, have a detrimental effect on fish and plant life. This latter problem is called thermal pollution.

EPA has the authority to establish environmental radiation standards that limit the amount of radioactivity that may be released by a nuclear power plant. The Atomic Energy Commission, which regulates development of the nuclear power industry, enforces these standards. EPA also reviews all proposals for the location, construction and operation of nuclear facilities to make sure they will not adversely affect people and the environment.

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Noise is an Invisible Pollution

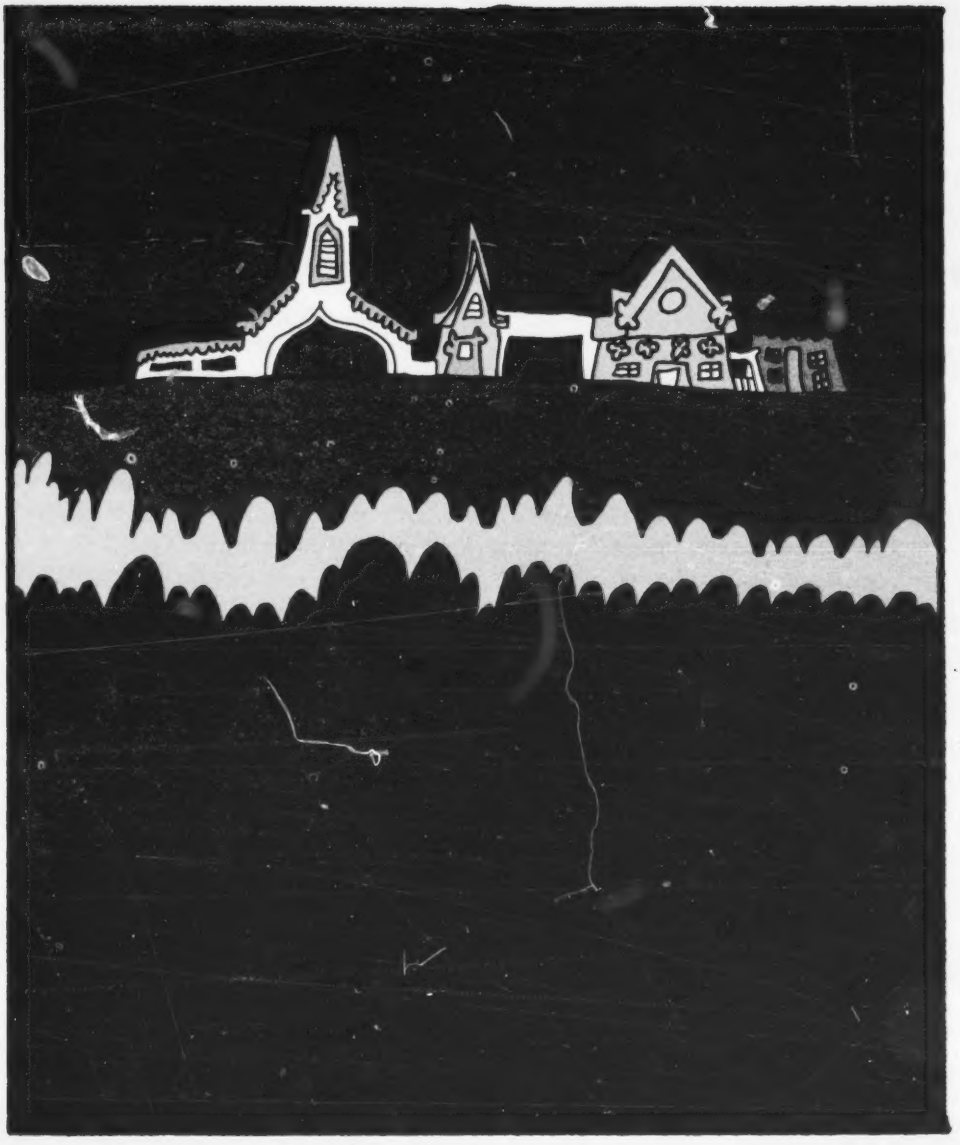
Noise is a danger to our health and welfare, especially in our congested urban areas. Jet planes, trucks, buses, railroad trains, power lawnmowers, motorcycles, snowmobiles, jackhammers and other construction equipment, kitchen appliances—those are some of the sources of noise that afflict our ears, endanger our hearing, and may even be affecting our hearts and other body functions.

Even when we try to escape the noise and congestion of our cities, noise follows us to the mountains and to the seashore. We just cannot get away from noise. The only alternative is to stop making so much noise, to lower the decibel din of our modern, mechanized way of life.

In response to growing public annoyance and protests about the growing noise problem, Congress enacted the Federal Noise Control and Abatement Act in 1972. Under this law, EPA will now begin to take steps to make life in the United States quieter and more pleasing. Here's how:

- EPA will study the effects of noise and issue regulations setting maximum noise levels necessary to protect public health and welfare, with an adequate margin of safety.
- EPA will issue noise-emission standards for major sources of noise in the environment—including trucks, railroads, buses, construction equipment, motors and electrical equipment.
- EPA will submit proposed regulations to control aircraft noise and sonic booms to the Federal Aviation Administration. The FAA will then use the EPA recommendations to establish and enforce aircraft noise standards.
- EPA will certify low noise-emission products and the Federal government will buy those products whenever possible instead of noisier ones.
- Noisy products that can damage public health or welfare will have to be labeled with their noise-emission levels.

Scientists and engineers already know how to control noise from many sources. We know how to make quieter construction equipment, cars, trucks, buses, airplanes and appliances. We know how to build sound-



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proof buildings and quieter machinery. The new noise pollution law will stimulate our country to use the noise control methods we already have —and the law will speed the development of new noise-control technology. We don't want to shout about it, but for the first time it appears that there's a quieter future ahead.

An Afterword

At the beginning of this book we compared the earth to a spaceship because it is a self-contained unit, and its resources are limited. In the pages that followed, we discussed the problems within our Spaceship Earth, as well as the actions being taken to resolve them. Perhaps there is no better way to end this book than with a description of the earth by a man who has viewed it from a unique and detached perspective—from the moon. That man is Astronaut Frank Borman. These are his words:

"When you are privileged to view the earth from afar, when you can hold out your thumb and cover it with your thumbnail, you realize that we are really, all of us around the world, crew members on the Space Station Earth. Of all the accomplishments of technology, perhaps the most significant one was the picture of the Earth over the lunar horizon. If nothing else, it should impress our fellow man with the absolute fact that our environment is bounded, that our resources are limited and that our life support system is a closed cycle. And, of course, when this Space Station Earth is viewed from 240,000 miles away, only its beauty, its minuteness and its isolation in the blackness of space are apparent. A traveler from some far planet would not know . . . that the breathing system is rapidly becoming polluted and that the water supply is in danger of contamination with everything from DDT to raw sewage. The only real recourse is for each of us to realize that the elements we have are not inexhaustible. We're all on the same spaceship."

So its up to us, as we said at the beginning of this book. "It is your world and my world, and only we can make sure that it's a good world."

United States
Environmental Protection Agency
Washington, D.C. 20460

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